

Comm.

Dr. Andervont
Dr. Huebner
Dr. Meier

MISCELLANEOUS

THE COUNCIL FOR TOBACCO RESEARCH - U.S.A., INC.

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NEW YORK, N. Y. 10022
(212) 421-8985

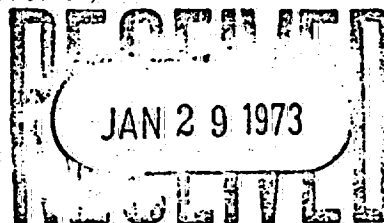
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CF421-6/1/64-6/1/65

Application for Research Grant
(Use extra pages as needed)

Date: 1/22/1973

1. Principal Investigator (give title and degrees):

Norman W. Heimstra, Ph.D.
Professor of Psychology and Director,
Human Factors Laboratory



2. Institution & address:

University of South Dakota
Vermillion, South Dakota 57069

3. Department(s) where research will be done or collaboration provided:

Department of Psychology

4. Short title of study:

Effects of Smoking Deprivation on Group Problem Solving Processes

5. Proposed starting date: September 1, 1973

6. Estimated time to complete: Two years

7. Brief description of specific research aims:

Increasingly, smokers are encountering situations where they are not allowed to smoke because of newly imposed restrictions. These situations range all the way from those encountered in public transportation systems to legislative committee meetings (see attached exhibit). While these restrictions are imposed because someone in authority views smoking as annoying or as a health hazard, little thought is given to the possible detrimental effects that smoking deprivation may have in terms of performance of the deprived smokers in, for example, committee meetings where problems are solved and decisions are made. The specific aims of this investigation are:

- 1) to study group problem solving efficiency under conditions where smokers are deprived, or are allowed to smoke to determine if smoking deprivation interferes with group processes involved, and
- 2) to systematically observe and record the group interactions to determine if differences exist between groups of smokers who are deprived or allowed to smoke. Of particular interest will be frequency of occurrence of behaviors categorized as aggressive, antisocial, etc.

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Previous research has shown that performance on various types of tasks and affective states, such as mood, are negatively affected when smokers are not allowed to smoke. These studies have involved individuals rather than groups. The working hypothesis is that because of the stress and affective states developed by forced smoking deprivation, group performance where members are deprived smokers will be less effective than performance in groups where smokers are allowed to smoke and in groups involving non-smokers. It is also hypothesized that the type of social interaction demonstrated by the deprived smoker groups will differ qualitatively from that in the other groups and that more "anti social" type behavior will be shown.

9. Details of experimental design and procedures (append extra pages as necessary)

Introduction

In earlier investigations by the applicant dealing with the effects of smoking on behavior, the experimental design has called for conditions where smokers were deprived. In several studies, marked differences in performance were noted between conditions where smokers were allowed to smoke and where smoking was not permitted. For example, in a study concerned with the effects of smoking on sustained performance in a driving simulator, deprived smokers performed significantly poorer than subjects who were allowed to smoke (Heimstra, Bancroft, & DeKock, 1967). Similar trends were found in a study designed to determine the relationship between smoking, psychomotor performance, and stress (Bancroft, Heimstra, & Warner, 1967). In studies where the mood of smokers and deprived smokers has been measured before and after exposure to various tasks, the mood of the deprived smokers has shown a great deal more instability than that of the smokers (Heimstra, 1973). In all of these investigations, it was obvious that the deprived smokers were under considerable stress and that their behavior and attitude toward the experimenter differed considerably from that of the smoker and non-smokers.

While the design of these experiments was such that subjects were tested individually, an interesting question is raised concerning the effects that smoking deprivation might have on group performance, i.e., situations where several individuals are required to contribute to the solution of a problem or make a decision. There has been an increasing trend toward banning smoking in staff meetings, committee meetings, etc. At the time this proposal is being written, the South Dakota Legislature is in the process of banning smoking in legislative committee meetings (see attached exhibit). While the justification for banning smoking is presented in terms of annoyance of non-smokers and possible health hazards involved for non-smokers, very little concern has been expressed regarding the possible detrimental effect smoking may have on the functioning of the various kinds of groups that are involved. The proposed investigation is designed to determine if, in fact, smoking deprivation has demonstrable effects in terms of group performance on specific tasks and also in terms of the types of social interactions demonstrated by members of the groups.

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Methods

The basic design of the proposed study is similar to that involved in previous research by the applicant dealing with smoking and behavior. Three conditions are utilized - one involving non-smokers, another involving smokers who are not allowed to smoke (smoker deprived) and a third condition involving smokers who are allowed to smoke. However, where previous studies have been concerned with the performance of individual subjects, the proposed study will deal with the performance of groups of subjects under these conditions. Groups of three subjects each (triads) will be utilized. A number of groups will be studied under each of the conditions, i.e., groups of three non-smokers, smokers, and deprived smokers, and their performance on a problem solving task obtained and recordings of social interaction made.

Group Problem Solving Task

The variables affecting group problem solving has been subjected to a great deal of research, much of which has been summarized by Kelley and Thibaut (1969). In these studies a wide variety of tasks have been utilized ranging from psychomotor tasks to those which are aimed at the most complex intellectual processes such as concept formation, detecting relationships, analogical reasoning, etc. The specific problem solving task to be used in the proposed study will be determined after a comprehensive search of the literature is made and after some pilot work has been conducted. The task selected for use will have to meet several important criteria: (1) It will be such that input from all three members of the group is necessary in order for progress to be made in arriving at a solution. (2) There will be various "stages" of solution each of which must be arrived at before the next stage can be solved. This will allow for a series of measures which can be obtained during the duration of the session, i.e., how long it took to solve each stage of the task and how accurate the solution was. (3) The problem will be such that a minimum of three hours will be required for its solution and possibly up to five hours. Since, in the "real world," committees are often required to meet until a particular problem is solved and a decision arrived at, this will add realism to the laboratory setting involved in the proposed study. Payment of the subjects will be based on a solution to the problem, not for the amount of time utilized. (4) It is necessary that the task be quantifiable in terms of duration and accuracy. If possible, the task will be such that not only will the performance of the group be measured but also the performance of each member of the group. (5) Several versions, or alternate forms, of the task will be developed in order to reduce the problem of communication about the nature of the task among the subjects tested at different times.

As indicated, the specific details of the problem solving task will be determined based on an extensive literature review and on exploratory research.

Systematic Observation of Group Interactions

There is a considerable amount of research in the behavioral sciences where behavior of interest to the investigator is categorized, subjects are observed, and the frequency of behavior demonstrated in the various categories is recorded. The applicant has conducted a number of different studies using this method with subjects ranging from fish, rats, and monkeys to children as they crossed streets. (see attached vita).

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9. Continued

The purpose of analyzing the interactions of group members in the proposed study is to determine whether the interaction within groups who have been deprived of smoking differs in any way from the interactions shown within the groups in the other conditions. There have been several systems of behavior categories developed within the last few years to encode social interaction and these are reviewed by Weick (1968). The method that appears to be most applicable to the proposed study is the Interaction Process Scores (IPS) developed by Bales (1950) and refined by Borgatta (1963) which has been used in a wide variety of studies in recent years. The IPS categories are listed below. Observers trained on this system show high between-observer reliability.

- 01 Common social acknowledgments
- 02 Shows solidarity through raising the status of others
- 03 Shows tension release, laughs
- 04 Acknowledges, understands, recognizes
- 05 Shows agreement, concurrence, compliance
- 06 Gives a procedural suggestion
- 07 Suggests a solution
- 08 Gives opinion, evaluation, analysis, expresses feelings or wish
- 09 Self-analysis and self-questioning behavior
- 10 Reference to the external situation as redirected aggression
- 11 Gives orientation, information, passes communication
- 12 Draws attention, repeats, clarifies
- 13 Asks for opinion, evaluation, analysis, expression of feelings
- 14 Disagrees, maintains a contrary position
- 15 Shows tension, asks for help by virtue of personal inadequacy
- 16 Shows tension increase
- 17 Shows antagonism, hostility, is demanding
- 18 Ego defensiveness

With this system of categories, the observer(s) record each time a subject in a group engages in behavior defined by a particular category. In the proposed study, the groups will work in a room which has been equipped with a concealed video-tape system. A time sampling technique will be used where the group interactions will be taped for certain periods of time during each hour, e.g., five minutes of taping every 15 minutes. The exact schedule will be determined by pilot work. Thus, instead of actually observing the subjects and categorizing the behavior directly, observers will categorize from the video-tapes. This allows for playback of behavior which may be difficult to categorize and for a consensus to be arrived at by several observers. In addition to the categories listed, additional information such as number of cigarettes smoked, will also be obtained.

General Procedures

The exact procedures to be utilized will depend upon the specific problem solving task selected for use in the study. In many studies on group problem solving behavior, it is necessary to familiarize subjects with the problem, explain procedures, etc., before the sessions are actually started. It is probable that this will be the case in the proposed study.

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Subjects will be selected on the basis of a questionnaire that has been utilized in a number of previous studies in this laboratory. Non-smokers are defined as individuals who have not used tobacco in any form for at least one year prior to answering the questionnaire. A smoker is defined as one who regularly smokes twenty or more cigarettes per twelve-hour waking day; who uses this form of tobacco exclusively or primarily; who consistently inhales; and who has so smoked for a period of at least one year prior to answering the questionnaire. When completing the questionnaire, usually in a University class of some sort, the individuals are under the impression that it is a smoking behavior survey. They are not aware that their qualifications as a potential subject in an experiment is determined on the basis of their responses. Individuals who qualify are contacted and asked if they wish to participate in a research project for which they will be paid. Subjects will be male college students.

Fifteen groups, each group consisting of three members, will be studied under each of the three conditions. Thus, 15 groups of non-smokers will be utilized, 15 groups of smokers who are allowed to smoke during the task, and 15 groups of smokers who are not allowed to smoke during the task. During test sessions no food or drink will be permitted under any of the conditions although individuals will be allowed to use toilet facilities (which adjoin the test room) and obtain a drink of water if they so desire. All smoking materials will be removed from subjects in the smoker condition and smoker-deprived condition before entering the test room. However, subjects in the smoker condition will be furnished with a choice of cigarettes in the room. This precludes the possibility of some unidentified smoking material, e.g., marihuana, being taken into the test situation.

Including the training time and a minimum of three hours in the test session, each subject will be involved in the study for at least four hours and possibly up to six hours. Subjects will not be paid on an hourly basis but, rather, for completing the problem. A bonus will be involved for rapid and accurate completion. Thus, a group will receive \$18 (\$6 for each subject) if they have spent the full five hours allowed and have not completed the problem. However, if they complete the problem in four hours they will receive the \$18 plus an additional \$6 (a total of \$8 per subject) and if they finish the problem in three hours they will receive the \$18 plus \$12 as a bonus or a total of \$30 per subject. A system such as this will be necessary in order to insure a high level of motivation on the part of the subjects and a serious effort at solving the problem. It will also create an atmosphere which will put a considerable amount of pressure on the subjects and which may enhance the possible effects of smoking deprivation. The above system will be used in pilot work and some modifications may be necessary but a remuneration system along these lines will be necessary.

It is difficult, of course, to duplicate in a laboratory setting all of the variables that might be of importance in the "real world." For example, the situation for the smoker-deprived subjects in the experiment will be somewhat more strenuous than might be encountered in the "real world" situation where an individual in a group where smoking was banned would probably "sneak" out for an occasional cigarette. While it would be interesting to add other groups where "smoking breaks" were allowed, this would rapidly increase the scope of the study. Similarly, it would be desirable to utilize older subjects as well as students in order to include some groups where the members had been

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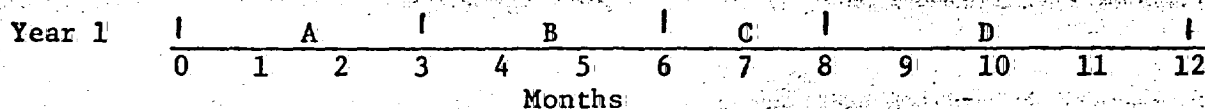
smoking for many years. Other interesting questions, such as the effects of smoking by some members of a group on the performance and behavior of non-smoking members, are also of interest. If results from the proposed study indicate that smoking deprivation does, indeed, have a significant effect on group behavior, future research might be conducted which includes these kinds of variables.

Data Analysis

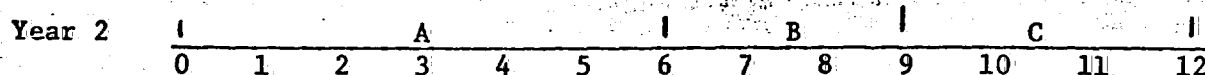
The data obtained from the measures of performance on the group problem solving task will be subjected to statistical analysis in order to determine whether differences existing between the performance of groups in the non-smoker, smoker deprived, and smoker condition, are significant. Measures of group performance, such as accuracy and speed, will be analyzed. However, an analysis will also be conducted on performance of the individuals within each group in order to determine whether patterns of individual performance differ between subjects in groups exposed to the different conditions.

Frequency of occurrence of the different categories of behavior obtained during the systematic observation of group interactions will be analyzed to determine if significant differences exist between the groups in the different conditions.

Time Frame



- A - Literature review and design of group problem solving test
- B - Pilot work and possible redesign of test
- C - Additional pilot work
- D - Subject testing



- A - Subject testing
- B - Data analysis
- C - Preparation of final report

References

- Bales, R. F. Interaction process analysis. Cambridge, Mass.: Addison-Wesley
- Bancroft, N.R., Heimstra, N.W. & Warner, H.D. Relationship between smoking, psychomotor performance, and stress. Final Report, Council for Tobacco Research, USA, 1967.
- Borgatta, E.F. A new systematic interaction observation system: behavior scores system. J. psychol. Stud., 1963, 14, 24-44.

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Heimstra, N.W. The effects of smoking on mood change. In W. L. Dunn (Ed.) Smoking behavior: Motives and incentives. Washington, D.C.: V. H. Winston & Sons, 1973.

Heimstra, N.W., Bancroft, N. R., & DeKock, A.R. Effects of smoking upon sustained performance in a simulated driving task. In H. B. Murphy (Ed.) The effects of smoking on the central nervous system. Ann. N.Y. Acad. Sci., 1967.

Kelley, H.H. & Thibaut, J.W. Group problem solving. In G. Lindzey and E. Aronson (Eds.) The handbook of social psychology (2nd ed., Vol.IV). Reading, Mass.: Addison-Wesley, 1969.

Weick, K. E. Systematic observational methods. In G. Lindzey and E. Aronson (Eds.) The handbook of social psychology (2nd Ed. Vol.II) Reading, Mass: Addison-Wesley, 1968.

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10. Space and facilities available (when elsewhere than item 2 indicates, state location):

The facilities of the Human Factors Laboratory are available for this study. A room with one-way mirrors and concealed video-tape equipment is available for testing groups. There is ready access to subjects and professional assistance in the form of advanced graduate students in psychology. Computer facilities available for data analysis.

11. Additional facilities required:

None

12. Biographical sketches of investigator(s) and other professional personnel (append):

13. Publications: (five most recent and pertinent of investigator(s); append list, and provide reprints if available).

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4.

14. First year budget:

A. Salaries (give names or state "to be recruited")

Professional (give % time of investigator(s)
even if no salary requested)

% time

Amount

Norman W. Heimstra

15

\$4200

Research Assistant (to be recruited-
Post MA level graduate student)

50

3600

Technical

Hourly assistance (observers, lab.
assistance, etc.) 400 hrs. at
\$3.00/hr.

1200

Sub-Total for A

\$9000

B. Consumable supplies (by major categories)

Video-tape supplies \$300
Test construction 500
Misc. 250

Sub-Total for B

\$1050

C. Other expenses (itemize)

Subjects for first year
(pilot work & actual testing
30 groups at \$30 each)

Sub-Total for C

\$900

Running Total of A + B + C

\$10,950

D. Permanent equipment (itemize)

None

Sub-Total for D

0

E. Indirect costs (15% of A+B+C)

E

\$1642

Total request

\$12,592

15. Estimated future requirements:

| | Salaries | Consumable Suppl. | Other Expenses | Permanent Equip. | Indirect Costs | Total |
|--------|----------|-------------------|----------------|------------------|----------------|----------|
| Year 2 | 9500 | 600 | 1300 | 0 | 1710 | \$13,110 |
| Year 3 | | | | | | |

Year 2

9500

600

1300

0

1710

\$13,110

Year 3

16. Other sources of financial support:

List financial support from all sources, including own institution, for this and related research projects.

| CURRENTLY ACTIVE | | | |
|---|--------------------------------|---------|---------------------|
| Title of Project | Source (give grant numbers) | Amount | Inclusive Dates |
| Accident Prevention Research | USPHS OH 00002-07 | 213,500 | 7/01/69 - 6/30/74 |
| Effects of Smoking on Peripheral Movement Detection | US Army DADA17-73- C 3037 | 17,000 | 11/01/72 - 10/30/73 |
| Noise and Human Performance | USPHS OH 00365-02 | 28,466 | 10/01/71 - 9/30/73 |

| PENDING OR PLANNED | | | |
|---|--------------------------------|--------|---------------------|
| Title of Project | Source (give grant numbers) | Amount | Inclusive Dates |
| Noise and Human Perf. (Renewal request) | OH 00365-03 | 30,041 | 10/01/73 - 09/30/75 |
| (Risk-taking and Hazard Perception in Farm Accidents (proposal submitted) | USPHS | 47,461 | 09/01/73 - 08/30/75 |

It is understood that the investigator and institutional officers in applying for a grant have read and accept the Council's "Statement of Policy Containing Conditions and Terms Under Which Project Grants Are Made."

Checks payable to

University of South Dakota

Mailing address for checks

Business Manager, Univ. of S.D.

Vermillion, South Dakota 57069

Principal investigator

Typed Name Norman W. Heimstra, Ph.D.

Signature Norman Heimstra Date 1/22/73

Telephone 605-677-5295

Area Code

Number

Extension

Responsible officer of institution

Typed Name Richard L. Bowen, Ph.D.

Title President

Signature Richard L. Bowen Date 1-24-73

Telephone 605-677-5641

Area Code

Number

Extension

1003539028

EXHIBIT

Joint Body Approves Rule To Ban Smoking At Meets

By TERRY DE VINE
Associated Press Writer

PIERRE (AP) — There may be a number of bills smoked out of committee during the 1973 legislative session, but there aren't going to be any legislators smoked-out of committee, literally, if a joint rule approved Thursday gets through both Houses.

The joint rules committee approved by a 5-1 vote a rule that would ban all smoking during House and Senate committee meetings.

The motion to approve the no smoking rule was made by Sen. Oscar Austad, R-Sioux Falls, who said, "I think it's time the legislature started protecting the rights of nonsmokers on committees."

The Sioux Falls lawmaker said he would like to see the no smoking ban extended to the floors of both chambers and the House and Senate galleries, but settled for a more limited rule.

"I think the members of each committee have the right to breathe pure air," said Austad. "In light of recent smoking studies, I feel smokers are infringing on the rights of nonsmokers."

The only member of the joint rules committee who didn't side with Austad was Sen. Charles Donnelly, D-Rapid City.

"Eight months ago today I gave up a three-pack-a-day habit," said Donnelly, "but I feel we are infringing on the rights of smokers if we pass this rule."

Rep. John Bibby, R-Brookings, who voted with Austad even though he himself is a smoker, said, "committee rooms are one thing, but ban-

ning smoking in the chamber is another thing." The Brookings Republican said he felt prohibiting smoking on the floor of the Houses might affect the work of legislators because the smoker might be ducking out for a cigarette occasionally during floor action or be unduly nervous or uncomfortable because they couldn't smoke.

The rule, which must be approved by both houses, is not expected to come up for debate until next week and opposition is certain.

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VITA

Norman W. Heimstra

I. Biographical Data

Born: October 14, 1930. Mitchell, South Dakota

Married - Three children

Present Address: Department of Psychology
University of South Dakota
Vermillion, South Dakota

Present Position: Professor
Director, Human Factors Laboratory

II. Military History

Five years U.S. Navy--1948-1953

III. Academic History

B.A. Univ. South Dakota, 1955

M.A. Univ. South Dakota, 1956

Ph.D. Univ. of Rochester, 1960

IV. Related Experience

1. Research Assistant - Univ. South Dakota Primate Laboratory (1955-1956).
2. Teaching Assistant - Univ. of Rochester, 1956-1957.
3. Research Associate - HumRRO (Geo. Wash. Univ.) 1957-1959.
4. U.S.P.H.S. Predoctoral Fellow - Univ. of Rochester, 1959-1960.
5. Research Scientist - HumRRO 1960-1961.
6. U.S.P.H.S. Postdoctoral Fellow, Univ. of South Dakota, 1961-1963.
7. Assistant Prof., Univ. of South Dakota, 1963-1964.
8. Associate Prof., Univ. of South Dakota, 1964-1967.
9. Professor, Univ. of South Dakota, 1967-

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V. Membership in Organizations, Consultantships, Advisory Panels

APA, Human Factors Society,
American Association for Automotive Medicine
Sigma Xi (President, South Dakota Chapter, 1965-1966)
Highway Research Board Liaison Representative--University
of South Dakota
Member of Special Committee 11--Driving Simulation,
Highway Research Board, National Academy of Science
Consultant--Department of Army (Design and Measurement
of Performance)
Advisory Panel--American Institute for Research
Editorial Board--Human Factors

VI. Academic Experience

Courses Taught--Introductory Psychology
Physiological Psychology (undergraduate)
Seminar in Physiological Psych. (graduate)
Seminar in Psychopharmacology (graduate)
Industrial Psychology (undergraduate)
Personnel Selection & Training (graduate)
Human Factors Psychology (graduate)
Seminar in Accident Prevention Research
(graduate)

Ph.D. Dissertations Directed

Arthur McDonald (1966) Modification of agonistic
behavior in fish

Truman M. Mast (1966) Influence of motivational
variables on prerest and postrest performance
in rotary pursuit tracking

Norris Bancroft (1968) Relationship between smoking
and psychophysiological response to stress

Mark Hofmann (1968) A comparison of visual, auditory
and electrocutaneous displays in a compensatory
tracking task

Arlan DeKock (1968) Relationship between decision
making under conditions of risk and selected
psychological tests

Vernon Ellingstad (1969) A multivariate evaluation
of selected driver performance measures

David Damkot (1969) A comparison of auditory,
visual, and electrocutaneous displays in a
vigilance task

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Gary Martin (1970) Hazard perception by children

Richard Lucas (1970) Development and evaluation of a part task film simulation technique for training drivers on a critical passing skill

Thomas R. Schori (1970) A comparison of visual, auditory, and cutaneous tracking displays when divided attention is required to a cross-adaptive loading task

Harold D. Warner (1970) Effects of intermittent noise on visual search tasks of varying complexity

Kent Kimball (1971) Combined task performance: A study of the effect of coded signal processing on a compensatory tracking task

John Fechter (1972) Effects of noise on skill acquisition

M.A. Theses Directed -- 25

1003539032

VII. Publications - Open Press and Technical Reports

1954

(With J. Cho) Perception of absolute size in a distorted room. Proc. S. Dak. Acad. Sci., 1954, 33, 44-47.

1955

(With R. T. Davis and M. Grodsky) Exploratory behavior in rats. Proc. S. Dak. Acad. Sci., 1955, 34, 93-103.

1956

(With H. Odio) Learning with food and non-food reward by rhesus monkeys. Proc. S. Dak. Acad. Sci., 1956, 35, 211-220.

1957

(With R. T. Davis and J. P. Steele) Effects of various food deprivation schedules on the discrimination learning performance of monkeys irradiated with X-Ray irradiation. J. Psychol., 1957, 44, 271-281.

1960

(With S. J. Goffard, R. S. Beecroft, and J. W. Openshaw) Basic electronics for minimally qualified men: An experimental evaluation of a method of presentation. HumRRO Tech. Report #61, 1960.

(With G. Newton) Effects of early experience on the response to whole body x-irradiation. Canad. J. Psychol., 1960, 14, 111-119.

1961

(With G. Newton) Effects of prior food competition on the rat's killing response to the white mouse. Behaviour, 1961, 14, 95-102.

Effects of chlorpromazine on dominance and aggressive behavior in the rat. Behaviour, 1961, 18, 313-321.

1962

Social influence on the response to drugs: I. Amphetamine sulfate. J. Psychol., 1962, 53, 233-244.

Effects of amphetamine sulfate on the behavior of paired rats in a competitive situation. Psychol. Rec., 1962, 12, 25-34.

1003539033

(With N. B. Louis and A. Young) Survey of operational rotary wing aviators flying activities. HumRRO Tech. Rep. #75, 1962.

(With N. B. Louis and A. Young) Survey of operational fixed wing aviators flying activities. HumRRO Tech. Rep. #76, 1962.

Social influence on the response to drugs: II. Chlorpromazine and ironiazid. Psychopharmacologia, 1962, 3, 72-78.

(With A. McDonald) Social influence on the response to drugs: III. Age factors in the response to amphetamine sulfate. Psychopharmacologia, 1962, 3, 212-218.

(With A. McDonald) Social influence on the response to drugs: IV. Stimulus factors. Psychol. Rec., 1962, 12, 327-330.

(With R. T. Davis) A simple recording system for the direct observation technique. Animal Behaviour, 1962, 10, 208-210.

(With T. M. Mast) Effects of prior social experience on amphetamine toxicity in mice. Psychol. Rep., 1962, 11, 809-812.

1963

(With T. M. Mast and L. L. Larrabee) Effects of fatigue on basic processes involved in human operator performance: I. Simple vigilance and target detection. Highway Research Record, 1963, 55, 17-20.

(With T. M. Mast and D. K. Spiegel) The relationship between operator mood and performance in a simulated driving task. Tech. Report No. 2, Human Factors Laboratory, University of South Dakota, 1963.

1964

(With A. L. McDonald) Modification of aggressive behavior of green sunfish with D-Lysergic acid diethylamide. J. Psychol., 1964, 57, 19-23.

(With T. M. Mast and H. F. Jones) The effects of fatigue on performance in a simulated driving task. Tech. Report No. 3, Human Factors Laboratory, University of South Dakota, 1964.

1003539034

(With H. F. Jones) An investigation of the relationship between performance on a "speed anticipation" test and driver performance. Tech. Report No. 4, Human Factors Laboratory, Univ. of South Dakota, 1964.

(With T. M. Mast) Effects of fatigue on vigilance. J. Engineering Psych., 1964, 3(3), 73-79.

(With H. F. Jones) Ability of drivers to make critical passing judgments. J. Engineering Psych., 1964, 3(4), 117-122.

1965

(With A. L. McDonald) Agonistic behavior in several species of fish. Psych. Rep., 1965, 16, 845-850.

(With H. F. Jones) Signal detection as function of location. Tech. Report No. 5, Human Factors Laboratory, Univ. of South Dakota, 1965.

A further investigation of the development of mouse killing in rats. Psychonomic Sci., 1965, 2, 179-180.

(With A. L. McDonald) Social influence on the response to drugs: V. Modification of behavior of non-drugged rats by drugged. Psychopharmacologia, 1965, 8, 174-180.

(With S. Sallee) Effects of early drug treatment on adult dominance behavior in rats. Psychopharmacologia, 1965, 8, 235-240.

1966

(With A. R. DeKock) Effects of sustained performance on differential angular velocity judgments. Tech. Rep. No. 6, Human Factors Laboratory, Univ. of South Dakota, 1966.

1967

(With N. R. Bancroft and A. R. DeKock) Effects of smoking upon sustained performance in a simulated driving task. In H. B. Murphy (Ed.), The effects of smoking on the central nervous system. Ann. N. Y. Acad. Sci., 1967.

(With V. S. Ellingstad) Performance decrement during 15 hours operation of a complex psychomotor task. Tech. Rep. No. 7, Human Factors Laboratory, Univ. of South Dakota, 1967.

1003539035

(With V. S. Ellingstad and A. R. DeKock) Effects of operator mood on performance in a simulated driving task. Perceptual and Motor Skills, 1967, 25, 729-735.

1968

(With D. K. Damkot and N. G. Benson) The effects of silt turbidity on behavior of juvenile largemouth bass and green sunfish. Tech. Paper, Bureau of Sport Fisheries & Wildlife, 1968.

(With A. L. McDonald and D. K. Damkot) Social modification of agonistic behaviour in fish. Animal Behaviour, 1968, 16, 437-441.

(With V. Ellingstad) Estimation of movement as a function of target speed, display distance, and concealment distance. Tech. Rep. No. 7, April, 1968, Human Factors Laboratory, USD.

1969

(With V. Ellingstad) Velocity-time estimation as a function of target speed and concealment extent. Human Factors, 1969, 11, 305-312.

(With J. Nichols and G. Martin) An experimental methodology for analysis of child pedestrian behavior. Pediatrics, 1969, 44, (part 2), 832-838.

1970

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